Chapter 10: Recommendations

As discussed above, the *Sediment Core Investigation* provides some important insight regarding water quality conditions within the Finger Lakes. However, the results of this investigation could be substantially enhanced by a number of additional activities as follows.

First, while the current study was successful in defining the chronology of chemical inputs within 9 of the 11 Finger Lakes, results were not sufficient for 2 of the lakes, namely, Cayuga Lake and Hemlock Lake. In both instances, radiometric findings were insufficient to define an accurate chronology of chemical patterns. It is suspected that the sediment cores from these two lakes were disturbed in some manner over time. Thus, it would be advantageous to revisit these 2 water bodies in an effort to complete our understanding of sediment chemical patterns within this important series of lakes. Equipment limitations with respect to maximum water depth for core collection was the likely reason for failure on Cayuga Lake, and future efforts should focus on deeper waters. The reason(s) for failure on Hemlock lake are not clear, however, it is recommended that follow-up sediment core investigations involve the collection of multiple cores and preliminary evaluation of radiometric markers in order to select the best candidate core for full assessment. A second rationale for revisiting Cayuga Lake relates to the fact that many of the inorganic results from the sediment core were well below levels observed within the other Finger Lakes, including Hemlock Lake. The reason(s) for this disparity are not clear at this point. Landuse patterns within the Cayuga Lake Watershed are not significantly different from those in certain other Finger Lakes watersheds, and, thus, the results are somewhat puzzling.

Second, *arsenic* findings within several of the Finger Lakes warrant additional study to assess both possible causes for observed increases within the upper sediments and possible environmental implications (human health and ecosystem). While limited water column sampling would appear to allay immediate concerns, follow-up investigation is certainly in order. For example, follow-up water column monitoring is warranted and should include: (a) lower analytical detection levels in the range of 1 ppb or better, given EPA's proposed revision in the MCL for arsenic, (b) better spatial resolution (both horizontal and vertical) to assess potential exposure, particularly in proximity to existing water intake locations, (c) better temporal resolution – particularly including measurements under differing dissolved oxygen conditions, and (d) arsenic speciation to determine the various forms of arsenic which are present. In addition, investigation of possible arsenic sources and its ecosystem processing within the Finger Lakes and surrounding watersheds is advisable. Finally, comparisons of the Finger Lakes arsenic findings with other lake sediment cores (particularly within the Lake Ontario Basin) would be of value.

Third, as with arsenic, *manganese* findings indicate significant enrichment of upper sediments within several of the Finger Lakes. While there are currently no established sediment quality assessment values for manganese, the levels observed, coupled with their coincidence with arsenic elevations, would warrant additional investigation. It is likely that the source(s) and/or mechanism(s) responsible for the observed arsenic enrichment are also responsible for the observed enrichment in manganese levels. Thus, it is recommended that any follow-up study of arsenic include investigation of manganese as well.

Fourth, *DDT* levels within the *biota* of several of the Finger Lakes (e.g., Conesus, Keuka, and Seneca Lakes) should continue to be monitored. It is important to determine future trends in DDT levels (e.g., decline, plateau, or increase) within predatory fish. An effort should be made to systematize this effort across each of the Finger Lakes to allow comparisons between lake systems.

Fifth, *PCB* results from this study were not definitive due to analytical detection limitations. Findings with respect to PCB congeners in several of the lakes (Conesus and Seneca Lakes) may warrant additional investigation. Core samples from each of the Finger Lakes for which PCB congener analyses were performed indicate that PCB congener levels exceed the TEL for total PCBs, and levels within several of the lakes (Otisco, Skaneateles, Owasco, Seneca, Keuka, Canadice, and Conesus Lakes) also exceeded the PEL for total PCBs. The fact that several of the lakes exhibited higher total PCB levels than did Canadice Lake (which currently has a fish consumption advisory) was somewhat surprising. It is recommended that other available information (e.g., fish flesh data, hazardous waste site information, etc.) be evaluated to determine if the observed PCB levels justify further investigation. Any future investigations should emphasize PCB congeners rather than Aroclors.

Sixth, the sediments from a number of the Finger Lakes were found to exceed the upper sediment assessment value for *nickel*. The significance of these findings should be assessed with respect to effects on resident biota and/or human health concerns, and the levels should be compared to levels in other parts of New York State.

Seventh, our investigation of *mercury* trends within the Finger Lakes was significantly hampered by analytical detection issues. The only acceptable, or reasonably complete, profile came from Seneca Lake and showed a moderate decline in mercury levels over the past several decades. It would be instructive to assess mercury trends in the other Finger Lakes. However, future sediment coring efforts will need to critically assess analytical detection issues if those efforts are to be fruitful. In particular, should Cayuga Lake and Hemlock Lake be revisited as discussed in recommendation 1 above, an effort should be made to utilize analytical methods capable of detecting mercury within those cores.

Eighth, observed *calcium* increases over the past half-century warrant additional investigation. The possible causes for the observed increases should be evaluated, and the ramifications of these increases should be assessed. In particular, the implications of increasing calcium levels as they relate to Zebra mussel population dynamics should be investigated.